INDUSTRIAL HYGIENE SUPPLEMENT, INDUSTRIAL MEDICINE

This Industrial Hygiene Section is published to promote sound thought upon and concerning industrial hygiene. To that end it will contain articles, discussions, news items, reports, digests, and other presentations, together with editorial comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

INDUSTRIAL HYGIENE

The Editorial Committee will exercise its best judgment in selecting for publication the material which presents most exactly the factors affecting industrial health and developments for control of potentially injurious exposures. The editors may not concur in opinions expressed by the authors but will endeavor to assure authenticity of fact.

The Science, the Law and the Economics of Industrial Health

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Dermatitis Cases

—Reported Among Workers in Seven States—

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DERMATITIS cases have been reported to the U. S. Public Health Service for a period covering more than 10 years, resulting in the gradual accumulation of a large number of records of individual cases. The first published report[1] included 9,116 dermatitis cases occurring prior to July, 1938. A second report[2] dealt with 32,512 dermatitis cases among males and females recorded during the period from July, 1938 to October, 1943. The present report is a more detailed analysis of these 32,512 cases with the addition of a table combining the two reports.

After discussing some of the problems relating to industrial and material exposure classifications, tables will be presented showing for each industry the material exposures associated with the dermatitis cases reported by that industry. Dermatitis cases classified by industry are presented separately for each of the following seven states reporting all or part of the time: California, Connecticut, Indiana, Michigan, North Carolina, Ohio and Wisconsin.

The weaknesses as well as the value of the data as received from state sources will be indicated and a model reporting form will be presented. All cases included were considered to be cases of dermatitis by the state reporting them. They were not necessarily disabling nor was compensation always paid or claimed. Diagnostic standards were set by each state which determined whether or not a physician's statement was necessary. The information received consistently for each dermatitis case was the name of the industry employing the worker and the material exposure believed to have caused the dermatitis. Workers exposed to the same hazards who did not acquire dermatitis are not recorded; hence, it is not possible to calculate frequency rates, that is to say, the average annual number of cases per 1,000 exposed workers.

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Classification of Industries

CLASSIFICATION of dermatitis cases by industry was facilitated by the use of a modification of the *Standard Industrial Classification Manual* prepared by the Division of Statistical Standards, Bureau of the Budget. Since industry was not always clearly defined on the dermatitis reports, only broad groupings could be used. Many groups are self-evident from the title as given in the paper but the following might require a brief explanation:

Other transportation equipment includes mostly railroad equipment. Food and kindred products manufacture includes meat packing, bakeries, flour mills, alcoholic and non-alcoholic beverages, canning, dairy products, and confectionery products. The great bulk of dermatitis cases reported under this heading originated in canneries processing fruits, vegetables and sea foods. Iron and steel and their products includes a wide variety of plants from blast furnaces and foundries to tin can and cutlery factories. All types of machinery manufacture were classified under machinery including electrical. Other and unspecified chemicals includes chiefly vegetable and animal oils, drugs and insecticides, soap, rayon, fertilizers, and industrial chemicals. Rubber products includes both natural and synthetic rubber. Textile mill products includes establishments performing any of the following operations regardless of the type of fiber used: (1) manufacturing yarn, thread, cordage and twine; (2) manufacturing woven cloth, carpets and rugs, braids, laces, and knit cloth; (3) dyeing and finishing fibers, yarn and cloth; (4) coating, waterproofing and otherwise treating fabrics. Lumber and timber products includes logging operations, sawmills, planing and plywood mills, as well as furniture and finished lumber products. Three-fifths of the dermatitis cases reported under this heading were from furniture factories. Non-ferrous metals and their products includes the industries listed in the standard classification, excluding electroplating. Ap-

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TABLE 1.—CLASSIFICATION OF 32,512 CASES OF DERMATITIS REPORTED BY 7 STATES TO THE U. S. PUBLIC HEALTH SERVICE ACCORDING TO INDUSTRY AND MATERIAL EXPOSURE, JULY 1938-OCTOBER 1943

Industry	Total	Oils and greases			Food products			Alkalis				Solvents	Metals			Plants and woods			Rubber and its compounds	Paints and thinners
		Total	Cutting oils	Other and unspecified oils and greases	Total	Edible plants	Meat and fish	Total	Soap and soap powders	Building cement and concrete	Other and unspecified alkalis		Total	Metal plating	Other and unspecified metals	Total	Plants	Woods		
Total	32,512	6,788	1,014	5,774	3,848	3,283	565	3,721	1,242	1,026	1,453	2,430	1,756	492	1,264	1,741	1,310	431	1,061	934
Manufacturing	23,155	6,140	856	5,284	3,247	2,743	504	1,479	280	211	988	1,577	1,630	464	1,166	644	269	375	1,006	623
Transportation equipment	5,887	2,244	306	1,938	2	2	—	454	67	33	354	590	761	77	684	77	24	53	155	226
Automobile and equipment	3,937	1,757	174	1,583	1	1	—	400	51	20	329	494	382	54	328	48	17	31	140	90
Aircraft and parts	1,658	461	128	333	—	—	—	39	15	3	21	85	360	22	338	17	4	13	14	115
Shipbuilding	265	18	2	16	1	1	—	14	1	10	3	8	19	1	18	12	3	9	1	19
Other transportation equipment	27	8	2	6	—	—	—	1	—	—	1	3	—	—	—	—	—	—	—	2
Food and kindred products	4,556	46	2	44	3,240	2,736	504	295	92	7	196	44	24	—	24	120	108	12	26	18
Iron and steel and their products	3,411	2,183	285	1,898	—	—	—	128	21	16	91	334	183	65	118	25	10	15	8	67
Machinery including electrical	2,250	1,180	219	961	—	—	—	90	14	7	69	263	113	41	72	8	3	5	9	67
Chemicals	1,226	20	3	17	4	4	—	105	15	7	83	48	29	6	23	8	4	4	3	60
Explosives	480	3	—	3	—	—	—	4	3	1	—	6	2	—	2	2	2	—	—	4
Plastic materials	194	3	1	2	—	—	—	2	—	1	1	3	3	—	3	—	—	—	—	4
Dye, paint, and varnish	145	7	1	6	—	—	—	7	—	1	6	27	3	—	3	—	—	—	—	45
Other and unspecified chemicals	407	7	1	6	4	4	—	92	12	4	76	12	21	6	15	6	2	4	3	9
Rubber products	1,068	32	1	31	—	—	—	31	16	9	6	54	7	1	6	7	7	—	786	24
Textile mill products	1,029	58	—	58	—	—	—	90	26	—	64	14	3	—	3	6	3	3	—	6
Lumber and timber products	842	36	2	34	—	—	—	41	4	13	24	29	13	7	6	304	33	271	—	93
Non-ferrous metals and their products	685	219	25	194	—	—	—	29	4	7	18	53	171	46	125	4	2	2	2	16
Stone, clay, and glass products	436	37	2	35	—	—	—	134	1	104	29	27	12	2	10	12	10	2	6	15
Leather and its products	347	2	1	1	—	—	—	21	3	4	14	18	2	1	1	1	—	1	5	2
Apparel	340	2	—	2	—	—	—	—	—	—	—	—	55	—	55	1	1	—	—	1
Electroplating	265	4	—	4	1	1	—	2	—	—	2	6	207	202	5	1	1	—	1	1
Printing	207	5	—	5	—	—	—	7	3	—	4	32	12	2	10	1	1	—	—	3
Paper and allied products	163	9	—	9	—	—	—	22	4	—	18	9	3	—	3	12	8	4	1	3
Other manufacturing industries	443	63	10	53	—	—	—	30	10	4	16	56	35	14	21	57	54	3	4	21
Wholesale and retail trade	2,528	147	12	135	444	393	51	842	678	21	143	284	8	—	8	66	60	6	9	50
Eating and drinking places	1,118	5	—	5	220	209	11	609	539	—	70	11	—	—	—	10	10	—	1	2
Filling stations, garages, and auto dealers	504	113	8	105	—	—	—	47	23	4	20	233	3	—	3	16	15	1	6	20
Food stores	318	8	1	7	201	162	39	29	17	—	12	4	1	—	1	4	2	2	1	3
Drug stores	152	1	—	1	6	6	—	71	59	—	12	1	—	—	—	—	—	—	1	—
Other wholesale and retail trade	436	20	3	17	17	16	1	86	40	17	29	35	4	—	4	36	33	3	—	25
Services	1,347	17	—	17	45	43	2	236	142	20	74	143	9	—	9	59	56	3	3	54
Laundries, and cleaning and dyeing establishments	304	—	—	—	1	1	—	42	14	—	28	96	—	—	—	1	1	—	1	2
Beauty parlors and barber shops	202	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hotels, rooming houses	200	—	—	—	27	26	1	82	61	4	17	10	1	—	1	9	9	—	1	3
Amusement and recreation	197	—	—	—	11	10	1	30	18	4	8	11	2	—	2	20	19	1	—	11
Medical and other health services	128	—	—	—	1	1	—	34	24	—	10	3	1	—	1	1	1	—	1	4
Other services	316	17	—	17	5	5	—	48	25	12	11	23	5	—	5	28	26	2	—	34
Construction	1,215	60	21	39	—	—	—	679	5	610	64	33	4	—	4	169	157	12	3	21
Government	731	14	—	14	16	11	5	114	49	40	25	49	3	—	3	183	181	2	18	43
Agriculture	685	3	—	3	47	47	—	25	4	2	19	9	—	—	—	336	335	1	4	7
Transportation, communication, and other public utilities	391	31	2	29	8	6	2	35	8	12	15	55	18	14	4	80	77	3	5	8
All other known industries	742	80	16	64	34	33	1	104	39	11	54	109	8	—	8	68	64	4	2	26
Unknown industries	1,718	296	107	189	7	7	—	207	37	99	71	171	76	14	62	136	111	25	11	102

parel includes all types of finished products made from fabrics and similar materials. One-half of the dermatitis cases from this group were from clothing factories, 38% were from hat factories and 12% were from fur clothing establishments. Printing includes all types of publishing and also lithographing, gravure and rotogravure, bookbinding, engraving, and electroplating. Other manufacturing includes the major groups of the standard classification: tobacco manufactures, products of petroleum and coal, and miscellaneous manufacturing industries.

Wholesale and retail trade follows the classification used in the *Standard Industrial Classification Manual, Volume 2, Non-manufacturing Industries*. Eating and drinking places includes restaurants, cafeteries, lunch rooms, refreshment stands and bars. Filling stations, garages and auto dealers includes groups selected from several parts of the standard classification. Wholesale and retail businesses are combined, as are also automobile dealers, garages and repair shops. All filling stations are included whether or not they do repairing. Food stores includes both wholesale and retail establishments handling groceries, meats, fruits, candies, or dairy products. Soda fountains are included under drug stores, indeed, most of the dermatitis cases from this group originate among soda fountain employees. Other wholesale and retail trade includes a wide variety of nonmanufacturing businesses. Seventy dermatitis cases originated in dry goods and apparel stores.

Service industries includes the same groups as the standard classification with the exception of automobile repair services and garages which are listed under wholesale and retail trade as described above. Laundries, and cleaning and dyeing establishments are combined. Dermatitis cases from the former industry represent 60% of those in this group. Amusement and recreation services includes the motion picture industry, dance halls, theatres, bowling alleys, athletic clubs, and race tracks. Most of the cases of dermatitis under medical and other services occurred in hospitals or in

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Industry	Other and unspecified chemicals	Fumigants, fungicides, and insecticides	Acids and acid fumes	Fabrics	Physical agents	Dyes, pigments, and dye intermediates	Mechanical agents	Explosives	Biologic agents	Pitch and heavy coal tar distillates	Glue and paste	Leather and hides	Insulating materials	Fumes and gases	Chromates and chromic acid	Synthetic resins or plastics	Cosmetics	Non-metallic elements	All other known exposures	Unknown exposures
Total	874	752	666	664	586	585	584	458	408	364	284	273	266	252	249	226	226	132	631	1,753
Manufacturing	592	225	522	603	312	491	369	452	152	127	261	267	217	150	229	218	—	83	358	1,181
Transportation equipment	83	6	146	28	80	34	116	—	27	26	67	21	97	40	67	18	—	18	75	429
Automobile and equipment	46	3	105	22	33	8	63	—	6	8	7	18	60	15	11	13	—	13	39	155
Aircraft and parts	29	3	38	3	15	19	37	—	17	2	59	1	15	13	56	5	—	5	23	227
Shipbuilding	7	—	3	—	31	2	16	—	4	16	1	2	21	12	—	—	—	—	12	46
Other transportation equipment	1	—	—	3	1	5	—	—	—	—	—	—	1	—	—	—	—	—	1	1
Food and kindred products	53	132	31	12	72	6	55	—	50	3	21	6	5	16	—	—	—	9	96	176
Iron and steel and their products	54	6	42	2	69	7	53	6	16	16	3	2	14	15	27	5	—	6	31	109
Machinery including electrical	46	4	92	1	25	4	33	1	12	8	—	3	43	13	23	23	—	12	17	160
Chemicals	114	46	29	—	9	31	7	442	12	2	7	3	3	15	24	151	—	4	12	38
Explosives	1	1	—	—	—	2	—	442	1	1	—	—	1	—	—	1	—	—	1	8
Plastic materials	8	2	—	—	1	1	1	—	2	—	1	—	—	2	—	150	—	1	1	9
Dye, paint, and varnish	6	7	6	—	—	24	—	—	2	—	4	—	—	3	1	—	—	2	—	3
Other and unspecified chemicals	99	36	23	—	8	4	6	—	7	1	2	3	2	10	23	—	—	1	10	18
Rubber products	36	3	4	13	4	3	3	—	1	—	4	1	5	9	—	3	—	12	1	25
Textile mill products	62	1	15	446	3	233	8	—	7	—	6	2	—	4	5	1	—	—	11	48
Lumber and timber products	23	11	2	16	11	8	26	—	5	45	112	1	8	5	4	3	—	2	3	41
Non-ferrous metals and their products	20	—	22	1	20	9	20	2	4	2	4	1	2	10	12	7	—	8	11	36
Stone, clay, and glass products	20	3	10	5	6	4	16	1	3	20	1	1	31	2	6	1	—	5	26	32
Leather and its products	10	3	6	1	1	23	2	—	—	—	6	217	2	—	4	—	—	—	2	19
Apparel	3	4	76	69	2	67	8	—	4	—	1	7	—	—	—	—	—	—	35	5
Electroplating	1	—	10	—	—	1	—	—	1	—	—	—	—	6	20	—	—	—	—	3
Printing	18	1	10	1	2	42	5	—	3	—	4	—	—	—	32	—	—	1	11	17
Paper and allied products	11	—	2	1	3	13	4	—	4	2	18	—	6	2	1	3	—	2	18	14
Other manufacturing industries	38	5	25	7	5	6	13	—	3	3	7	2	1	13	4	3	—	4	9	29
Wholesale and retail trade	25	161	20	17	82	38	40	—	42	2	8	3	7	10	—	—	10	1	59	153
Eating and drinking places	5	107	1	—	46	1	10	—	18	—	—	—	—	3	—	—	—	1	4	64
Filling stations, garages, and auto dealers	6	6	15	—	5	2	5	—	—	1	—	—	—	3	—	—	—	—	3	20
Food stores	3	11	—	—	5	1	7	—	6	—	4	—	—	1	—	—	—	—	12	17
Drug stores	2	17	—	—	20	—	7	—	1	—	—	—	—	—	—	—	1	—	9	15
Other wholesale and retail trade	9	20	4	17	6	34	11	—	17	1	4	3	7	3	—	—	9	—	31	37
Services	83	83	27	8	26	14	27	—	62	16	4	1	4	14	3	1	213	3	112	80
Laundries, and cleaning and dyeing establishments	7	6	8	3	9	7	7	—	13	—	—	—	—	2	—	—	—	—	87	12
Beauty parlors and barber shops	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	200	—	1	—
Hotels, rooming houses	8	12	3	—	4	1	4	—	10	—	—	—	—	3	—	—	—	—	8	14
Amusement and recreation	11	24	3	2	6	1	11	—	20	—	1	—	—	1	—	—	12	—	7	13
Medical and other health services	8	14	7	—	2	1	1	—	14	2	—	—	—	2	—	1	1	1	3	26
Other services	49	26	6	3	5	4	4	—	5	14	3	1	4	6	3	—	—	2	6	15
Construction	5	3	6	—	45	—	19	1	4	77	—	—	21	17	—	—	—	5	15	28
Government	12	37	11	1	24	5	24	1	61	24	—	—	2	10	1	—	1	10	15	52
Agriculture	20	136	1	1	23	—	14	—	24	3	—	—	—	3	—	—	—	2	12	15
Transportation, communication, and other public utilities	7	7	6	4	16	5	19	—	10	23	1	—	2	4	1	2	—	9	9	26
All other known industries	45	50	21	10	31	7	27	3	22	10	1	—	3	16	2	—	2	9	17	35
Unknown industries	85	50	52	20	27	25	45	1	31	82	9	2	10	28	13	5	—	10	34	183

the offices of physicians or dentists. Included under other services were 68 cases of dermatitis in photographic studios, 29 cases in undertaking establishments, and 45 cases among domestic workers.

The construction industry includes all types of contractors,, building, highway, and marine construction. Also included are subcontractors for plumbing, painting, electrical work, concrete work, carpentry and plastering. Government service includes all levels, county, city, state, and Federal.

Classification of Material Exposures

AFTER examining a large number of terms used in reporting the material exposure of specific cases of dermatitis the following classification was decided upon. Each term describing material exposure was placed under one of 27 main headings. To clarify the content of the various headings there is listed under each a few of the terms found in actual case reports. It will be observed that these terms vary greatly in exactness, some being general in nature and others referring to a specific hazard. Usually the reports of dermatitis do not name the cause but merely tell what the employee was working with or handling at the time he acquired the dermatitis. The same substance may be called by a different name according to the state reporting. When trade names are used it is often difficult to make an accurate classification since the constituent substances are not known. Materials of indefinite composition which are not satisfactory for exact classification of exposure are placed within quotation marks.

The classification of material exposures is as follows:

1. Acids and acid fumes:
   Arsenous acid, carbolic acid, benzolic acid, formic acid, hydrochloric acid, lactic acid, muriatic acid, nitric acid, oxalic acid, picric acid, salicylic acid, sulfuric acid, tannic acid.
2. Alkalis:
   Ammonia, borax, building cement, calcium chloride, caustic soda, concrete, flux, lime, lye, plaster, potash,

soda ash, soda water, soap, soap powder, trisodium phosphate, washing powder, water softener.

3. Biologic agents:
Animal parasites, anthrax, bacterial infection, boils, fungous infection, glanders, gnat bites, grain itch, impetigo, infections, insect bites, mange, mites, ringworm, scabies, vaccinia, yeasts.
4. Chromates and chromic acid:
Bichromate solution, "chrome solution," chromic acid, "dichromate solution," potassium bichromate.
5. Cosmetics:
Bleaches, creams, hair dyes, perfumes, permanent wave solutions, rouge, skin cleaners, hair tonics.
6. Dyes, pigments, and dye intermediates:
Aniline dyes, coal tar dyes, inks, shoe dyes, tinting solution.
7. Explosives:
Ammonium picrate, "blasting powder," "detonators," D.N.T., dynamite, lead azide, lead styphnate, mercury fulminate, "primer," T.N.T., tetryl.
8. Fabrics:
Cloth, dress materials, silk, upholstery, wool, yarn.
9. Food products:
Asparagus, carrots, celery, chocolate, cinnamon, dough, figs, fish, flour, fowl, fruits, grapefruit, hops, lemons, limes, meat, molasses, olives, oranges, peas, pears, pork, rice, sardines, shrimp, spinach, sugar, tomatoes, vanilla, walnuts.
10. Fumigants, fungicides, and insecticides:
"Antiseptic," arsenate of lead, Bordeaux mixture, "ceresan," chlorine solution, copper sulfate, cresol, "disinfectant solution," formaldehyde, nicotine spray, mercuric chloride, phenol, pyrethrum, sodium fluoride, "spray material," "sterilizing solution," "weed killer."
11. Fumes and gases:
Ammonia fumes, "chemical fumes," "gas from refrigerator," soldering fumes, tar fumes, "vulcanizing fumes."
12. Glue and paste:
Casein glue, gelatin glue, glass cement, mastic glue, mucilage, rubber cement, "water proof glue."
13. Insulating materials:
Asbestos, "celotex," glass wool, "halowax," mica, mineral wool, rock wool, sheet rock, spun glass.
14. Leather and hides:
Leather gloves, leather sleeves, leather shoes, "skins," "tanning compounds."
15. Mechanical agents:
Friction, irritation, motion, pressure, scratches, trauma.
16. Metals and metal plating:
"Alloys," aluminum, amalgams, babbitt metal, brass, cadmium, cast iron, copper, dural, galvanizing solution, lead, nickel, magnesium, manganese, mercury, platinum, "plating solution," sheet metal, steel, solder, tin, zinc.
17. Non-metallic elements:
Bromine, carbon, chlorine, fluorine, iodine, lamp black, soapstone.
18. Oils and greases:
Castor oil, coconut oil, "coning oil," crude oil, "cutting oil," fish oil, grease, "lapping oil," linseed oil, "lubricating oil," "machine oil," olive oil, paraffin oil, pine oil, soluble oil, sulfonated oil, tung oil.
19. Other and unspecified chemicals:
Trade name only given, composition unknown. Chemicals used in specified industrial process, photographic chemicals, treating solution, inhibitor, polish.

TABLE 2.—PERCENT OF DERMATITIS CASES REPORTED BY 7 STATES IN THE THREE MOST IMPORTANT MATERIAL EXPOSURES FOR EACH INDUSTRY

Industry	Rank 1		Rank 2		Rank 3	
	Material exposure	Percent	Material exposure	Percent	Material exposure	Percent
Beauty parlors and barber shops	Cosmetics[1]	99.0	Fumigants, fungicides and insecticides	.5	All other known exposures	.5
Explosives	Explosives	93.6	Solvents	1.3	Paints and thinners	.9
Plastic materials	Synthetic resins or plastics	81.1	Other and unspecified chemicals	4.3	Paints and thinners	2.2
Electroplating	Metals[2]	79.0	Chromates and chromic acid	7.6	Acids and acid fumes	3.8
Rubber products	Rubber and its compounds	75.4	Solvents	5.2	Other and unspecified chemicals	3.4
Food and kindred products	Food products	74.0	Alkalis	6.7	Fumigants, fungicides and insecticides	3.0
Food stores	Food products	66.8	Alkalis	9.6	All other known exposures	4.0
Leather and its products	Leather[3] and hides	66.2	Dyes, pigments and dye intermediates	7.0	Alkalis	6.4
Iron and steel and their products	Oils and greases	66.1	Solvents	10.1	Metals	5.6
Eating and drinking places	Alkalis	57.8	Food products	20.9	Fumigants, fungicides and insecticides	10.2
Construction	Alkalis	57.2	Plants and woods	14.2	Pitch and heavy coal tar distillates	6.5
Machinery, including electrical	Oils and greases	56.4	Solvents	12.6	Metals	5.4
Drug stores	Alkalis	51.8	Physical agents	14.6	Fumigants, fungicides and insecticides	12.4
Agriculture	Plants and woods	50.2	Fumigants, fungicides and insecticides	20.3	Food products	7.0
Filling stations, garages and auto dealers	Solvents	48.1	Oils and greases	23.4	Alkalis	9.7
Automobile and equipment	Oils and greases	46.4	Solvents	13.0	Alkalis	10.6
Textile mill products	Fabrics[4]	45.5	Dyes, pigments and dye intermediates	23.8	Alkalis	9.2
Hotels, rooming houses	Alkalis	44.1	Food products	14.5	Fumigants, fungicides and insecticides	6.4
Lumber and timber products	Plants and woods	38.0	Glue and paste	14.0	Paints and thinners	11.6
Nonferrous metals and their products	Oils and greases	33.7	Metals	26.3	Solvents	8.2
Medical and other health services	Alkalis	33.3	Fumigants, fungicides and insecticides	13.7	Biologic agents	13.7
Stone, clay and glass products	Alkalis	33.2	Oils and greases	9.2	Insulating materials	7.7
Laundries, and cleaning and dyeing establishments	Solvents	32.9	All other known exposures	29.8	Alkalis	14.4
Aircraft and parts	Oils and greases	32.2	Metals	25.2	Paints and thinners	8.0
Dye, paint and varnish	Paints and thinners	30.3	Solvents	12.0	Dyes, pigments and dye intermediates	16.9
Government	Plants and woods	27.0	Alkalis	16.8	Biologic agents	9.0
Other and unspecified chemicals	Other and unspecified chemicals	25.4	Alkalis	23.6	Fumigants, fungicides and insecticides	9.3
Apparel	Acids and acid fumes	22.7	Fabrics	20.6	Dyes, pigments and dye intermediates	20.0
Printing	Dyes, pigments and dye intermediates[5]	22.1	Solvents	16.8	Chromates and chromic acid	16.8
Transportation, communication and other public utilities	Plants and woods	21.9	Solvents	15.1	Alkalis	9.6
Other wholesale and retail trade	Alkalis	21.5	Plants and woods	9.0	Solvents	8.8
Other services	Other and unspecified chemicals	16.3	Alkalis	15.9	Paints and thinners	11.3
Amusement and recreation	Alkalis	16.3	Fumigants, fungicides and insecticides	13.0	Biologic agents	10.9
All other known industries	Solvents	15.4	Alkalis	14.7	Oils and greases	11.3
All other manufacturing	Oils and greases	15.2	Plants and woods	13.8	Solvents	13.5
Paper and allied products	Alkalis	14.8	All other known exposures	12.1	Glue and paste	12.1
Shipbuilding	Physical agents	14.1	Insulating materials	9.6	Metals	8.7

[1] The actual ingredients in cosmetics which might be responsible for the dermatitis were not specified.
[2] Although metals were reported as the most important exposure-producing dermatitis in the electroplating industry it is well-known that the real hazard consists of the acids and alkalis used for cleaning the metal and in the plating bath.
[3] Leather itself does not produce dermatitis but it is the alkalis used for removing the hair from the hides, the acid pickling solutions, the tanning agents, or the dyes which cause the trouble.
[4] In textile mills dermatitis comes from the dyes and mordants used in the finishing of cloth rather than from the untreated fabric.
[5] In general the dyes and pigments used in printing are less important in the production of dermatitis than are the solvents employed for cleaning the type or the solutions used for cleaning the hands.

20. Paints and thinners:
Enamels, glazes, Japan compounds, lacquer, "paint thinner," shellac, "stains," "varnish," water colors.
21. Plants and woods:
Arbor vitae, boxwood, Brazilian walnut, cashew, cedar, cocobolo, daffodil, ebony, hay, hemp, hyacinth, jute, laurel, lawn seed, mahogany, nettle, orris root, plywood, poison oak, poison ivy, primrose, redwood, straw, sumac, teak, tobacco, tulip, yew.
22. Physical agents:
Cold, electricity, heat, moisture, radium, steam, sunlight, water.
23. Pitch and heavy coal tar distillates:
Asphalt, creosote, road tar, roofing, "wood preserving."
24. Rubber and its compounds:
Adhesive tape, friction tape, neoprene, rubber boots, rubber cloth, rubber gloves, synthetic rubber.
25. Solvents:
Acetone, amyl acetate, benzene, benzine, benzol, butyl alcohol, butyl glycol, carbon disulfide, carbon tetrachloride, cleaning solution, ethyl acetate, ethyl alcohol, ethyl ether, ethyl glycol, ethylene glycol, ethyl benzene, gasoline, kerosene, metal cleaner, methyl acetate, methyl alcohol, methyl glycol, methylene chloride, naptha, paint remover, permachlor, "shoe cleaner," toluol, trichlorethylene, "Turco," turpentine, wood alcohol, xylene, xylol.
26. Synthetic resins or plastics:
"Bakelite," formica, "plaskon," "plastic material," phenol formaldehyde.
27. All other known exposures not classified above.

Industrial Group and Material Exposure

TABLE 1 presents a classification of 32,512 dermatitis cases reported by seven states to the U. S. Public Health Service, covering the period from July, 1938, through October, 1943. From this table it is possible to observe all the various material exposures associated with dermatitis cases reported by any particular industry.

Certain material exposures are seen to be associated with dermatitis cases in a large number of different industries. Alkalis and solvents appear in all industries except apparel, and beauty parlors and barber shops. Paints and thinners appear in all except drug stores, and beauty parlors and barber shops. Other and unspecified chemicals are missing only in beauty parlors and barber shops. There are some "all other known exposures" in each industry except electroplating, and dye, paint and varnish manufacture.

Other material exposures are found in only a few of the 38 industries listed. For example, cosmetics appear in seven industries, explosives in eight industries, meat and fish in nine industries, metal plating in 15 industries and edible plants in 18 industries.

Still other material exposures which might be expected to have a rather limited industrial distribution appear in many industries. More than two-thirds of the industries showed dermatitis cases associated with rubber and its compounds; fumigants, fungicides and insecticides; acids and acid fumes; and dyes, pigments and dye intermediates. Although certain material exposures are characteristic of certain industries, yet very diverse types of exposure may also occur in those industries.

In order to see more easily the relation of material exposures and industry, Table 2 has been prepared showing the first, second, and third most important material exposure for each industrial group.

In some industries the principal exposure is similar to the product manufactured. For example, the explosives industry had 93.6% of the dermatitis cases attributed to explosives, plastic materials manufacture 81.1% to plastics, rubber products manufacture 75.4% to rubber, food products manufacture 74.0% to food products, retail food stores 66.8% to food, leather manufacture 66.2% to leather, and textile mill products manufacture 45.5% to fabrics. Ninety-nine percent of all dermatitis cases in beauty and barber shops was attributed to "cosmetics."

It will be noted that in the instance of leather, fabrics, and cosmetics the real dermatitis hazard and the reported exposure are not the same. The reported exposure is not sufficiently detailed to be of value in determining the cause of the dermatitis. For example, leather itself does not produce dermatitis but it is the alkalis used for removing the hair from the hides, the acid pickling solutions, the tanning agents, or the dyes which cause the trouble. Unless the actual material is known no diagnosis is possible. All that can be said is that a certain worker has dermatitis due to one or more unknown substances.

Several industries related to the fabrication of metals such as iron and steel and their products, nonferrous metals, machinery, aircraft and parts, and automobile and equipment show the principal exposure to be oils and greases. The percent of dermatitis cases for which this exposure was mentioned ranged as high as 66.1% in the iron and steel industry. In electroplating metals were said to cause 79.0% of the dermatitis cases.

The construction industry and certain trade and service industries reported alkalis as the most important material exposure. For the construction industry alkalis (mostly building cement and concrete) represented 57.2% of the total. Alkalis in the form of soap or cleaning powders were found in 57.8% of the cases from eating and drinking places, 51.8% of the cases from drug stores, and 44.1% of those from hotels and rooming houses. Amusement and recreation services, and medical and other health services showed 16.3%

TABLE 3.—NUMBER AND PERCENTAGE OF 32,512 CASES OF DERMATITIS ACCORDING TO MATERIAL EXPOSURE (BASED ON TABLE 1)

Material exposure	Number	Percent
Total	32,512	100.0
Oils and greases	6,788	20.9
Cutting oils	1,014	3.1
Other and unspecified oils and greases	5,774	17.8
Food products	3,848	11.8
Edible plants	3,283	10.1
Meat and fish	565	1.7
Alkalis	3,721	11.4
Soap and soap powders	1,242	3.8
Building cement and concrete	1,026	3.1
Other and unspecified alkalis	1,453	4.5
Solvents	2,430	7.5
Metals	1,756	5.4
Metal plating	492	1.5
Other and unspecified metals	1,264	3.9
Plants and woods	1,741	5.4
Plants	1,310	4.1
Woods	431	1.3
Rubber and its compounds	1,061	3.3
Paints and thinners	934	2.9
Other and unspecified chemicals	874	2.7
Fumigants, fungicides, and insecticides	752	2.3
Acids and acid fumes	666	2.0
Fabrics	664	2.0
Physical agents	586	1.8
Dyes, pigments, and dye intermediates	585	1.8
Mechanical agents	584	1.8
Explosives	458	1.4
Biologic agents	408	1.3
Pitch and heavy coal tar distillates	364	1.1
Glue and paste	284	.9
Leather and hides	273	.8
Insulating materials	266	.8
Fumes and gases	252	.8
Chromates and chromic acid	249	.8
Synthetic resins or plastics	226	.7
Cosmetics	226	.7
Non-metallic elements	132	.4
All other known exposures	631	1.9
Unknown exposures	1,753	5.4

and 33.3%, respectively, with exposure to alkalis. Likewise the stone, clay and glass industry showed 33.2% and the paper and allied products industry 14.8% with exposure to alkalis.

Industries where much of the work is performed outdoors show the greatest exposure to plants and woods. This exposure amounted to 50.2% of the dermatitis cases in agriculture, 38.0% in lumber and timber products, 27.0% in government work (local, state, and federal) and 21.9% for transportation, communication and other public utilities. By far the most common of the plants and woods producing dermatitis were poison ivy and poison oak.

Filling stations, garages and auto dealers; and laundries, and cleaning and dyeing establishments; had solvents (gasoline and cleaning fluids) as the principal exposure with percentages of 48.1 and 32.9, respectively.

Almost one-half of the industrial groups had no single material exposure which amounted to as much as 35% of the dermatitis cases. In these industries exposures were diversified, covering a wide range of substances. Alkalis and solvents predominated. They ranked first or second in importance in 13 out of 18 of these industries. The greatest range of exposures was found in the paper and allied products and the shipbuilding industries, which had less than 15% of the cases in any one material exposure group.

Table 3 shows a percentage distribution of dermatitis cases by material exposure. Four groups, namely oils and greases, food products, alkalis, and solvents, account for more than half of all dermatitis cases reported. On the other hand, 57% of the exposure groups include only 19% of the dermatitis cases. Eleven exposure groups showed less than 500 cases each.

Less Frequent Material Exposures by Industry

WHEN considered from the viewpoint of industry an examination of certain less frequent material exposures appears to be of little interest since the percentage of dermatitis cases attributed to any one of these causes remains insignificant. However, from the viewpoint of material exposure it is of much interest to learn in which particular industries a certain relatively infrequent exposure is reported. The following discussion is limited to the 12 material exposure groups which have a maximum of less than 25% in any one industry. The three industries having the largest percentages are listed for each group.

Dyes, pigments and dye intermediates occurred most frequently in the manufacture of textile mill products (23.8%), in printing (22.1%), and in apparel manufacture (20.0%). Acids and acid fumes were most common in apparel manufacturing (22.7%), in medical and other health services (6.9%), and in other manufacturing (6.0%). The reason for the high percentage under apparel manufacturing was the inclusion of the fur felt hat industry.

TABLE 4.—CLASSIFICATION OF 32,512 CASES OF DERMATITIS ACCORDING TO INDUSTRY AND STATE OF ORIGIN

Industry	Total	California	Connecticut	Indiana	Michigan	North Carolina	Ohio	Wisconsin
Total	32,512	16,103	3,627	584	4,517	1,405	4,365	1,911
Manufacturing	23,155	8,843	3,291	540	4,391	1,194	3,450	1,446
Transportation equipment	5,887	1,434	178	59	3,875	28	207	106
Automobile and equipment	3,937	70	—	44	3,556	1	179	87
Aircraft and parts	1,658	1,126	175	7	315	6	22	7
Shipbuilding	265	231	3	—	4	14	2	11
Other transportation equipment	27	7	—	8	—	7	4	1
Food and kindred products	4,556	3,925	12	58	28	37	228	268
Iron and steel and their products	3,411	514	2,120	99	69	7	486	116
Machinery including electrical	2,250	765	236	61	314	6	618	250
Chemicals	1,226	538	54	163	2	191	247	31
Explosives	480	129	27	147	—	171	6	—
Plastic materials	194	50	12	3	—	—	116	13
Dye, paint, and varnish	145	86	1	—	—	18	38	2
Other and unspecified chemicals	407	273	14	13	2	2	87	16
Rubber products	1,068	127	62	30	10	1	776	62
Textile mill products	1,029	116	93	12	14	678	63	53
Lumber and timber products	842	297	16	15	19	181	118	196
Non-ferrous metals and their products	685	245	243	12	22	2	121	40
Stone, clay, and glass products	436	252	12	7	6	12	127	20
Leather and its products	347	84	13	1	8	17	74	150
Apparel	340	89	165	9	4	—	33	40
Electroplating	265	89	9	—	2	—	148	17
Printing	207	83	2	4	5	13	92	8
Paper and allied products	163	58	21	3	4	9	28	40
Other manufacturing industries	443	227	55	7	9	12	84	49
Wholesale and retail trade	2,528	1,911	84	2	29	45	345	112
Eating and drinking places	1,118	915	63	—	3	5	95	37
Filling stations, garages, and auto dealers	504	388	13	2	8	11	63	19
Food stores	318	229	5	—	5	9	52	18
Drug stores	152	102	—	—	2	9	28	11
Other wholesale and retail trade	436	277	3	—	11	11	107	27
Services	1,347	950	66	2	19	21	192	97
Laundries, and cleaning and dyeing establishments	304	218	14	1	3	9	49	10
Beauty parlors and barber shops	202	121	24	—	4	—	24	29
Hotels, rooming houses	200	148	3	—	1	4	29	15
Amusement and recreation	197	173	1	—	3	—	11	9
Medical and other health services	128	84	2	—	—	4	29	9
Other ervices	316	206	22	1	8	4	50	25
Const uction	1,215	872	106	3	15	78	52	89
Government	731	552	1	1	4	10	94	69
Agriculture	685	583	17	—	20	2	33	30
Transportation, communication and other public utilities	391	289	10	3	3	8	63	15
All other known industries	742	619	5	—	3	3	96	16
Unknown industries	1,718	1,484	47	33	33	44	40	37

Fumigants, fungicides, and insecticides represented 20.3% of the exposures in agricultural employment, 13.7% in medical and other health services, and 13.0% in amusement and recreation services. Chromates and chromic acid were represented in 16.8% of the dermatitis cases occurring in printing and in less than 8% in electroplating and in the manufacture of "other chemicals."

Physical agents which include heat, cold, electricity and moisture were most important in drug stores (14.6%), shipbuilding (14.1%), transportation, communication and other public utilities (4.4%), and eating and drinking places (4.4%). Glue and paste occurred in 14.0% of the cases reported by the lumber and timber products industry, in 12.1% from the paper and allied products industry, and 4.1% from the aircraft and parts industry. Included in the above industries are furniture manufacture, bookbinding and plywood construction. Bacterial, parasitic and fungous diseases are grouped under biologic agents which appeared most frequently in medical and other health services (13.7%), in amusement and recreation services (10.9%), and in government service (9.0%).

Pitch and heavy coal tar distillates, mechanical agents (friction, pressure and trauma), insulating materials, and fumes and gases did not appear among as much as 10% of the dermatitis cases in any industry. However, the industry with the largest percentage in each instance was shipbuilding.

Non-metallic elements had a maximum occurrence of only 2.5% in transportation, communication and other public utilities.

A more detailed breakdown of certain material exposure items not shown in Table 3 reveals that vegetable oils appeared in 36 cases, and fats and waxes in 15 cases under oils and greases. Under metals there were 56 cases of mercury, 24 cases of chrome, 24 cases of nickel, and five cases of alloys and amalgams. Specified under woods were plywood six and mahogany nine cases. Tobacco was mentioned 42 times under plants. Biologic agents may be further divided into bacterial infection 197 cases, fungi 97 cases, parasites 17 cases, and all other 97 cases. Included under non-metallic elements were 17 cases associated with halogens. Dyes, pigments, and dye intermediates included 103 cases classed as having exposure to inks. Burns comprised 106 of the 586 cases associated with physical agents.

Dermatitis Cases by State

TABLES 4, 5, and 6 show the distribution of 32,512 dermatitis cases by state of origin and industry. It will be observed from Table 5 that nearly one-half of the cases of dermatitis reported were from the State of California. Distribution by industry is very uneven. For example, more than three-fourths of all cases in the following industries were from California: shipbuilding; food and kindred products; eating and

TABLE 5.—PERCENTAGE DISTRIBUTION OF 32,512 CASES OF DERMATITIS ACCORDING TO STATE OF ORIGIN, BY INDUSTRY

Industry	Total	California	Connecticut	Indiana	Michigan	North Carolina	Ohio	Wisconsin
Total	100.0	49.5	11.2	1.8	13.9	4.3	13.4	5.9
Manufacturing	100.0	38.2	14.2	2.3	19.0	5.2	14.9	6.2
Transportation equipment	100.0	24.4	3.0	1.0	65.8	.5	3.5	1.8
Automobile and equipment	100.0	1.8	—	1.1	90.3	*	4.6	2.2
Aircraft and parts	100.0	67.9	10.6	.4	19.0	.4	1.3	.4
Shipbuilding	100.0	87.2	1.1	—	1.5	5.3	.8	4.1
Other transportation equipment	100.0	25.9	—	29.7	—	25.9	14.8	3.7
Food and kindred products	100.0	86.1	.3	1.3	.6	.8	5.0	5.9
Iron and steel and their products	100.0	15.1	62.1	2.9	2.0	.2	14.3	3.4
Machinery including electrical	100.0	34.0	10.5	2.7	13.9	.3	27.5	11.1
Chemicals	100.0	43.9	4.4	13.3	.2	15.6	20.1	2.5
Explosives	100.0	26.9	5.6	30.6	—	35.6	1.3	—
Plastic materials	100.0	25.8	6.2	1.5	—	—	59.8	6.7
Dye, paint, and varnish	100.0	59.3	.7	—	—	12.4	26.2	1.4
Other and unspecified chemicals	100.0	67.1	3.4	3.2	.5	.5	21.4	3.9
Rubber products	100.0	11.9	5.8	2.8	.9	.1	72.7	5.8
Textile mill products	100.0	11.3	9.0	1.2	1.4	65.9	6.1	5.1
Lumber and timber products	100.0	35.3	1.9	1.8	2.2	21.5	14.0	23.3
Non-ferrous metals and their products	100.0	35.8	35.5	1.7	3.2	.3	17.7	5.8
Stone, clay, and glass products	100.0	57.8	2.8	1.6	1.4	2.7	29.1	4.6
Leather and its products	100.0	24.2	3.8	.3	2.3	4.9	21.3	43.2
Apparel	100.0	26.2	48.5	2.6	1.2	—	9.7	11.8
Electroplating	100.0	33.6	3.4	—	.8	—	55.8	6.4
Printing	100.0	40.1	1.0	1.9	2.4	6.3	44.4	3.9
Paper and allied products	100.0	35.6	12.9	1.8	2.5	5.5	17.2	24.5
Other manufacturing industries	100.0	51.2	12.4	1.6	2.0	2.7	19.0	11.1
Wholesale and retail trade	100.0	75.6	3.3	.1	1.2	1.8	13.6	4.4
Eating and drinking places	100.0	81.8	5.6	—	.3	.5	8.5	3.3
Filling stations, garages, and auto dealers	100.0	77.0	2.6	.4	1.6	2.2	12.5	3.7
Food stores	100.0	72.0	1.6	—	1.6	2.8	16.3	5.7
Drug stores	100.0	67.1	—	—	1.3	5.9	18.4	7.3
Other wholesale and retail trade	100.0	63.5	.7	—	2.5	2.5	24.6	6.2
Services	100.0	70.5	4.9	.1	1.4	1.6	14.3	7.2
Laundries, and cleaning and dyeing establishments	100.0	71.7	4.6	.3	1.0	3.0	16.1	3.3
Beauty parlors and barber shops	100.0	59.9	11.9	—	2.0	—	11.9	14.3
Hotels, rooming houses	100.0	74.0	1.5	—	.5	2.0	14.5	7.5
Amusement and recreation	100.0	87.8	.5	—	1.5	—	5.6	4.6
Medical and other health services	100.0	65.6	1.6	—	—	3.1	22.7	7.0
Other services	100.0	65.2	7.0	.3	2.5	1.3	15.8	7.9
Construction	100.0	71.8	8.7	.3	1.2	6.4	4.3	7.3
Government	100.0	75.5	.1	.1	.6	1.4	12.9	9.4
Agriculture	100.0	85.1	2.5	—	2.9	.3	4.8	4.4
Transportation, communication, and other public utilities	100.0	73.9	2.6	.8	.8	2.0	16.1	3.8
All other known industries	100.0	83.4	.7	—	.4	.4	12.9	2.2
Unknown industries	100.0	86.4	2.7	1.9	1.9	2.6	2.3	2.2

*Less than .05%.

drinking places; filling stations, garages, and auto dealers; amusement and recreation services; government service; agriculture; all other known industries; and unknown industries. Less than 15% of the dermatitis cases were from California in automobile and equipment manufacture, rubber products, and textile mill products.

Other states with more than half of all dermatitis cases in certain industries included: Michigan with 90.3% of the automobile and equipment cases; Connecticut with 62.1% of the iron and steel and their products cases; Ohio with 59.8% of the plastic materials cases, 55.8% of the electroplating cases, and 72.7% of the rubber products cases; and North Carolina with 65.9% of the textile mill products cases.

When 50% or more of the dermatitis cases for a particular industry were reported by a single state it is evident the results for the industry as a whole will be influenced by the type of work and the conditions of work in one state. Thus dermatitis attributed to food and kindred products is representative of the problems arising in the canneries of California, but does not reflect conditions in canneries of other states such as Ohio or Wisconsin.

A few industries do not show a concentration of dermatitis cases in any state as great as 36%. Such industries are machinery, including electrical; explosives; lumber and timber products; paper and allied products; and non-ferrous metals and their products.

The distinction between the number of dermatitis cases reported in a state and the number actually occurring in that state must always be kept in mind. The two totals may approach each other but the ideal of complete reporting is never attained. In any state a low percentage of dermatitis in a particular industry does not necessarily mean that conditions are especially good. It is more likely to mean incomplete reporting. Some states include dermatitis cases from a wide range of industries and from plants of all sizes while others appear to concentrate on a limited number of causes from a relatively few large industrial establishments.

Table 6 shows that there are great differences in the types of dermatitis cases reported by each of seven states. In Connecticut, Indiana, and Michigan manufacturing accounts for more than 90% of the total. Specific manufacturing industries important in certain states include iron and steel and their products with 58.4% of the dermatitis cases in Connecticut, automobile and equipment with 78.7% in Michigan, textile mill products with 48.3% in North Carolina, chemicals (largely explosives) with 27.9% in Indiana, and food and kindred products with 24.4% in California. Wisconsin, Ohio, and California have a wider distribution of dermatitis cases than the other states. California exceeds the other states in the percentage of cases reported from eating and drinking places; filling stations, garages, and auto dealers; food stores; drug

TABLE 6.—PERCENTAGE DISTRIBUTION OF 32,512 CASES OF DERMATITIS ACCORDING TO INDUSTRY, BY STATE OF ORIGIN

Industry	Total	California	Connecticut	Indiana	Michigan	North Carolina	Ohio	Wisconsin
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Manufacturing	71.2	54.9	90.7	92.5	97.2	85.0	79.0	75.7
Transportation equipment	18.1	8.9	4.9	10.1	85.8	2.0	4.7	5.6
Automobile and equipment	12.1	.4	—	7.5	78.7	.1	4.1	4.5
Aircraft and parts	5.1	7.0	4.8	1.2	7.0	.4	.5	.4
Shipbuilding	.8	1.4	.1	—	.1	1.0	*	.6
Other transportation equipment	.1	.1	—	1.4	—	.5	.1	.1
Food and kindred products	14.0	24.4	.3	9.9	.6	2.6	5.2	14.0
Iron and steel and their products	10.5	3.2	58.4	17.0	1.5	.5	11.1	6.1
Machinery, including electrical	6.9	4.7	6.5	10.4	7.0	.4	14.2	13.1
Chemicals	3.8	3.3	1.5	27.9	.1	13.6	5.7	1.6
Explosives	1.5	.8	.8	25.2	—	12.2	.1	—
Plastic materials	.6	.3	.3	.5	—	—	2.7	.7
Dye, paint, and varnish	.4	.5	*	—	—	1.3	.9	.1
Other and unspecified chemicals	1.3	1.7	.4	2.2	.1	.1	2.0	.8
Rubber products	3.3	.8	1.7	5.1	.2	.1	17.8	3.2
Textile mill products	3.2	.7	2.6	2.1	.3	48.3	1.4	2.8
Lumber and timber products	2.6	1.8	.4	2.6	.4	12.9	2.7	10.3
Non-ferrous metals and their products	2.1	1.5	6.7	2.1	.5	.1	2.8	2.1
Stone, clay, and glass products	1.3	1.6	.3	1.2	.1	.9	2.9	1.0
Leather and its products	1.1	.5	.4	.2	.2	1.2	1.7	7.8
Apparel	1.0	.6	4.6	1.5	.1	—	.8	2.1
Electroplating	.8	.6	.2	—	*	—	3.4	.9
Printing	.6	.5	.1	7	.1	.9	2.1	.4
Paper and allied products	.5	.4	.6	.5	.1	.6	.6	2.1
Other manufacturing industries	1.4	1.4	1.5	1.2	.2	.9	1.9	2.6
Wholesale and retail trade	7.8	11.9	2.3	.3	.7	3.2	7.9	5.8
Eating and drinking places	3.4	5.7	1.7	—	.1	.4	2.2	1.9
Filling stations, garages, and auto dealers	1.6	2.4	.4	.3	.2	.8	1.4	1.0
Food stores	1.0	1.4	.1	—	.1	.6	1.2	.9
Drug stores	.5	.7	—	—	.1	.6	.6	.6
Other wholesale and retail trade	1.3	1.7	.1	—	.2	.8	2.5	1.4
Services	4.1	5.9	1.8	.4	.4	1.5	4.4	5.1
Laundries, and cleaning and dyeing establishments	.9	1.4	.4	.2	.1	.6	1.1	.5
Beauty parlors and barber shops	.6	.7	.7	—	.1	—	.6	1.5
Hotels, rooming houses	.6	.9	.1	—	*	.3	.7	.8
Amusement and recreation	.6	1.1	*	—	*	—	.2	.5
Medical and other health services	.4	.5	*	—	—	.3	.7	.5
Other services	1.0	1.3	.6	.2	.2	.3	1.1	1.3
Construction	3.7	5.4	2.9	.5	.3	5.6	1.2	4.7
Government	2.3	3.4	*	.2	.1	.7	2.2	3.6
Agriculture	2.1	3.6	.5	—	.4	.1	.8	1.6
Transportation, communication, and other public utilities	1.2	1.8	.3	.5	.1	.6	1.4	.8
All other known industries	2.3	3.9	.2	—	.1	.2	2.2	.8
Unknown industries	5.3	9.2	1.3	5.6	.7	3.1	.9	1.9

*Less than .05%.

stores; laundries, cleaning and dyeing establishments; hotels and rooming houses; amusement and recreation services; agriculture; shipbuilding; and the manufacture of food and kindred products.

Wisconsin has a larger proportion of dermatitis cases than the other states in the leather industry, paper industry, beauty parlors and barber shops, and government service. Ohio has a larger proportion in the rubber products industry; the manufacture of plastic materials; electroplating; the machinery industry; stone, clay and glass products industry; printing; other wholesale and retail trade; and medical and other health services.

Same Material Exposure and Same Industry

THE same industry may report a very different percentage of dermatitis cases for the same material exposure in one state than in another state. This is due to a number of reasons among which are variations in the types of activity carried on under the same broad industrial group, differences in the completeness of reporting of specific kinds of dermatitis cases, and differences in the definition of what constitutes a dermatitis case. For example, the iron and steel products industry reported oils and greases as the cause for dermatitis in 24.0% of the cases for that industry in California, 42.7% from Wisconsin, 46.2% from Ohio, and 80.4% from Connecticut. Among food and kindred products workers edible plants and meats were associated with 57.1% of the dermatitis cases from Ohio, 68.0% of the cases from Wisconsin and 75.7% of the cases from California. Dermatitis due to fabrics was the cause reported for 25.8% of the textile mill cases in Connecticut, 46.0% of the textile cases in North Carolina, and 50.9% of the textile cases in California. Among government workers plants and woods were reported as a cause of dermatitis in 22.1% of the cases from California and in 35.2% of the cases from Ohio. Laundries, cleaning and dyeing establishments had percentages of 31.1 for solvents in California and 39.1 in Ohio.

Some material exposure groups appear relatively stable in the same industry in different states. The machinery (including electrical) industry reported the percentage of dermatitis cases due to oils and greases to be as follows: Michigan 53.2%, Ohio 55.2%, California 55.5%, Connecticut 62.6%, and Wisconsin 62.7%. Filling stations, garages and auto dealers had 50.5% of their dermatitis cases due to solvents in California and 54.8% in Ohio. The aircraft and parts industry had 9.6% for paints and thinners in California and 9.7% in Michigan. The construction industry showed 61.3% of the dermatitis cases due to alkalis in California and 62.3% for this cause occurred in North Carolina.

The preceding paragraphs have shown for specific industries, the percentage of dermatitis cases attributed to a given material exposure in several different states. It is of interest also to examine for specific material exposure groups, the percentage of dermatitis cases falling within a given industry in various states. The food and kindred products manufacturing industry represented 86.4% of all dermatitis cases attributed to food products in California, 81.9% in Wisconsin, 74.1% in Michigan, 63.6% in North Carolina, 62.9% in Ohio, and 6.7% in Connecticut. In the last state, reported cases of dermatitis due to food products were almost entirely from eating and drinking places rather than from food manufacturing plants.

The combined iron and steel and machinery industries included 85.7% of all dermatitis cases classified under oils and greases in Connecticut, 77.6% in Indiana, 70.5% in Wisconsin, 65.7% in Ohio and 43.9% in California. The aircraft industry accounted for 21.7% of the oil and grease dermatitis cases in California, thereby reducing the percentage under iron and steel and machinery. The construction industry represented 42.9% of all dermatitis cases grouped under alkalis in North Carolina, 24.5% in California, 8.9% in Connecticut, and 2.8% in Michigan. Instead of the construction industry alkalis were found under iron and steel in Connecticut and under the automobile industry in Michigan. The lumber and timber products industry included 93.7% of all dermatitis cases listed as exposed to plants and woods in North Carolina, 47.6% in Wisconsin, 14.7% in Ohio, 10.5% in Michigan, and 9.4% in California. In Ohio, plants and woods were most frequently reported in government service. In Michigan the chief industry was automobile and parts, and in California it was agriculture.

The state by state distribution of dermatitis cases according to industry could be continued for the remaining material exposure groups, but sufficient examples have been given to show the extreme variation. The same material exposure group may yield a very different percentage of dermatitis cases for a certain industry in one state and another. Although the distribution of the employed population by industry varies according to state, still the extremes are not so great as for the reported dermatitis cases. This again indicates the importance of differences in reporting with some industries much more completely covered than others.

Comparison with Earlier Study

TO THE 32,512 cases of the present paper it is possible to add another 9,116 cases reported to the U. S. Public Health Service prior to 1938. Table 7 gives

TABLE 7.—NUMBER AND PERCENTAGE OF CASES OF DERMATITIS ACCORDING TO MATERIAL EXPOSURE. (PRESENT EXPERIENCE OF 32,512 CASES COMBINED WITH AN EARLIER REPORTED EXPERIENCE[1] OF 9,116 CASES)

Material exposure	Number	Percent
Total	41,628	100.0
Petroleum products and greases	7,805	18.8
Alkalis (and cement)	4,881	11.7
Solvents	3,265	7.8
Plants and woods	2,719	6.5
Metals and metal plating	2,482	6.0
Rubber and its compounds	1,314	3.2
Burns, physical and mechanical agents	1,313	3.2
Chemicals unspecified	1,253	3.0
Paints, enamels, and varnishes	1,132	2.7
Acids and acid fumes	978	2.4
Dyes and dye intermediates	974	2.3
Chromates and chromic acid	727	1.7
Biologic agents	520	1.3
Coal tar products	462	1.1
Furs and fur dyes, and hides	425	1.0
Synthetic resins	390	.9
Non-metallic elements	185	.4
Oils, vegetable (oils, fats, and waxes)	92	.2
All other known exposures	8,064	19.4
Unknown exposures	2,647	6.4

[1]See reference 1.

the results of the combination. A broader classification in the earlier report necessitates a large "all other known exposures" group. Of the specific exposures petroleum products and greases form the largest group with 18.8%. They are followed by alkalis (including cement) with 11.7%, solvents with 7.8%, plants and woods with 6.5% and metals and metal plating with 6.0%. When material exposures are ranged according to importance in each of the two studies the five most important are the same but plants take second place

in the earlier study and food products in the later study. This is caused by the inclusion of different states in the sample reporting. Some of the material exposures of much greater importance in the earlier study are chromates and chromic acid, dyes and dye intermediates, and cyanides. Certain exposures which were not separately listed in the earlier study were of sufficient importance to receive individual mention in the later study. These include cosmetics; explosives; fabrics; food; fumigants, fungicides and insecticides; fumes and gases; glue and paste; and insulating materials. Cyanides, dessicators, and halogens which had separate listings previously, were not distinguished in the later study because of infrequent occurrence.

Suggested Report Form

SINCE the deficiencies of the present methods of reporting dermatitis cases have been revealed by the foregoing analysis, it is appropriate at this point to explain methods which should tend to overcome these difficulties.

There is no substitute for the careful preparation of dermatitis reports which signifies a genuine interest on the part of the reporter in arriving at the true cause of the trouble. However, to be most useful, observations must be presented in a standardized form so that comparisons by industry and by region can be made.

An approach to an ideal form for the routine reporting of dermatitis cases must be from the standpoint of maximum simplicity consistent with the precise description of dermatitis-producing materials. At the outset it must be clearly understood that such a form cannot take the place of careful studies by trained dermatologists, but it can be of great assistance in pointing out where detailed studies should be made. It is obvious that certain information must be included in the report for each dermatitis case. The date and the exact place of occurrence is needed. This includes the state and the name and address of the employer. The employee who has been affected must be identified, including his name, age, sex and race. Also essential is a broad classification of the industry in which he was employed and a description of the work he was performing at the time he suffered the attack of dermatitis. Most difficult to secure although of the greatest importance, is a knowledge of the exact material causing the dermatitis. It is not sufficient to mention sterilizing solution but the specific ingredients such as cresol, phenol, or mercuric chloride should be named. Finally, an effort should be made to describe the methods by which the diagnosis was proved, for example, the use of patch tests. If any question concerning the details of a particular report arises it should be possible to identify the original person who was responsible for its preparation.

Such information might be arranged as shown in the accompanying form (4 in. x 6 in.).

It is believed that this form contains the minimum essentials for the routine reporting of dermatitis cases. Anything less would provide insufficient data to warrant the time and effort required in preparation. Once well established such a system of reporting should not be burdensome to maintain.

Report of Dermatitis from State of_____

Number_____ Date_____

Employee_____ Race_____ Age_____ Sex_____

Employer—Name_____

Address_____

Industry_____

Work being performed_____

Material causing dermatitis_____

How proved_____

Prepared by_____

Conclusion

A STUDY of 32,512 cases of dermatitis reported to the U. S. Public Health Service, by seven states from July, 1938, through October, 1943, revealed the material exposures associated with dermatitis cases from particular industries. It was observed that in certain industries the principal material exposure is similar to the product manufactured. Included in this group were the explosives industry, plastic materials manufacture, rubber products manufacture, food products manufacture and leather manufacture. Industries related to the manufacture of metals showed the principal exposure to be oils and greases. However, nearly one-half of the industrial groups had no single material exposure which amounted to as much as 35% of the dermatitis cases.

Wide differences were found in the distribution of dermatitis cases from a particular industry among the seven reporting states. Nearly one-half of all dermatitis cases reported were from the state of California, while more than 80% of the cases from the shipbuilding industry, food and kindred products industry, eating and drinking places, amusement and recreation, and agriculture were from that state. Michigan had 90% of the automobile and equipment cases and Connecticut 62% of the iron and steel and their products cases. Such differences are probably more a matter of variation in reporting than of actual differences in the incidence of dermatitis.

Examination of dermatitis cases for the same material exposure and the same industry in different states showed little uniformity in the percentage of cases from a particular exposure group.

A combination of previous experience with the present study yielded a total of 41,628 dermatitis cases. The principal material exposures for these cases were petroleum products and greases 18.8%, alkalis 11.7%, solvents 7.8%, plants and woods 6.5%, and metals and metal plating 6.0%.

In addition to the findings reported above it is believed that the industrial and material exposure classifications which were devised during the analysis of these data will be found of value in future studies of the incidence of dermatitis cases. The industrial classification is based on the *Standard Industrial Classification Manual* prepared and revised in 1944, by the Division of Statistical Standards of the U. S. Bureau of the Budget. The material exposure classification was gradually built up as the volume of reported dermatitis cases accumulated. It represents the greatest detail into which the data as received can be divided with any degree of certainty.

It is evident from data examined during the preparation of this study that much remains to be accomplished, especially in the field of precise description of material exposures. In order to initiate measures for the control of dermatitis it is essential to know the exact constituents of all the substances thought to have produced dermatitis. The general terms in which

reports are too frequently worded give little aid in advancing the scientific study of dermatitis.

As a contribution to better and more accurate reporting a model form is presented which contains the minimum information necessary for the description of a dermatitis case.

References

1. SCHWARTZ, LOUIS: The Incidence of Occupational Dermatoses and Their Causes in the Basic Industries. *J.A.M.A.*, 111:1523, October 22, 1938.

2. BRINTON, H. P.: Dermatitis Cases Reported Among Employed Males and Females in Seven States. INDUSTRIAL MEDICINE, 13:6, 514, June, 1944.

American Industrial Hygiene Association
News of Local Sections

Michigan Section

THE Recognition and Control of Industrial Deafness," was the subject of the April 27 meeting of the Michigan Industrial Hygiene Society. L. A. WATSON, President of the Maico Company, a graduate of the University of Minnesota, a Rhodes Scholar at Oxford University, and a recognized national authority, discussed this subject under the three sections: (1) possible prevention of hearing loss; (2) diagnostic procedures; and (3) rehabilitation. The Maico Company is a pioneer in medical electronics and supplies a large percentage of the medical hearing test equipment produced in this country. This subject is receiving increased attention and deserves more thorough investigation and application of control measures.

DR. RAYMOND HUSSEY, Dean of the School of Occupational Health, Wayne University, addressed the June 6 meeting on the subject "Occupational and Environmental Hygiene." DR. HUSSEY has been Chairman of the Committee of Industrial Health of the Maryland State Medical Society. He served as commanding officer and director of the Industrial Hygiene Laboratory of the U. S. Army at Baltimore, Maryland. He outlined the design of the new School of Occupational Health which is at present in the organizational stage, and emphasized that the principal purpose of this school is to integrate medicine, engineering and administration. He recalled the doubts that were raised more than 20 years ago when the Harvard School of Public Health was being organized as to who would be interested sufficiently to become students at the school, whereas today there is a waiting list. The same doubts arise today regarding the new School of Occupational Health, but DR. HUSSEY has no apprehension regarding student interest and the eventual growth of the school.

At the election of officers, A. O. THALACKER, of the Detrex Corporation, became president for the coming year; FRANK JARZYNKA, M.D., Medical Director of the Bohn Aluminum & Brass Company, President-Elect; and A. C. FUNKE, of the West Disinfectant Company, Secretary-Treasurer.

Pittsburgh Section

THE Effect of Dust on the Lungs" was discussed by DR. J. W. MILLER, of the U. S. Bureau of Mines, at the April 27 meeting. DR. MILLER drew on his extensive experience with the U. S. Public Health Service in the presentation of this subject.

Metropolitan New York Section

AN AFTERNOON conference meeting was held on May 10 at the American Museum of Natural History. The following six subjects were ably covered by members of the Metropolitan New York Section:

"Current Status of Air Disinfection"—LEON BUCHBINDER, PHD., Bacteriologist, Department of Health, City of New York.

"Field Method for the Estimation of Nitrogen Dioxide—Nitrogen Tetroxide in Air"—MORRIS B. JACOBS, PHD., Senior Chemist, Department of Health, City of New York. MILTON BRODEY, Fire Department, City of New York.

"Lead Fume Exposure from Flame Cleaning

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and Cutting Painted Steel"—ARTHUR E. PERINA, Engineer, BENJAMIN FEINER, Engineer, SAMUEL MOSKOWITZ, Chemist, Division of Industrial Hygiene, New York Department of Labor.

"Control of Lead Fume from Side Seaming Machines in the Can Industry"—MERRIL EISENBUD, Industrial Hygienist, Liberty Mutual Insurance Company, New York City. JAMES W. MCEWAN, Continental Can Company, New York City.

"Hazards of Confined Spaces in Navy Yard Work"—LT. COM. M. EDWARD TELL, M.C., Industrial Health and Sanitation Officer, Navy Yard, New York.

"Benzene and its Determination"—BENJAMIN DOLIN, Chemist, Division of Industrial Hygiene, New York Department of Labor.

Chicago Section

THE subject of air-conditioning was presented at the April 26 meeting. WILLIAM BODINUS, Engineer of the Carrier Corporation, discussed "Comfort Air Conditioning in Industry" from an engineering point of view. LT. COL. WILLIAM J. MCCONNELL, Safety and Security Branch of the Office of Chief of Ordnance, discussed "Effect of Air Conditioning on Sickness and Absenteeism Rates." The current medical literature on industrial hygiene was discussed by DR. HAROLD STEINBERG, the chemical and engineering phases by F. A. VAN ATTA, PH.D.

New A.I.H.A. Officers

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, Election of New Officers: Since transportation limitations prevented the holding of the usual annual meeting, the announcement of officers was circulated to the membership of the Association by mail. ROBERT M. KEHOE, M.D., Director of the Kettering Laboratories of Applied Physiology, University of Cincinnati, became President. FRANK A. PATTY, Industrial Hygiene Consultant, General Motors Corporation, was made President-Elect. ALLEN D. BRANDT, SC. D., Safety & Security Branch, Office of the Chief of Ordnance, was elected Secretary for a three-year term. The three new directors are EDGAR C. BARNES, Industrial Hygiene Engineer, Westinghouse Electric & Manufacturing Company, WILLIS G. HAZARD, Acting Chief, New Jersey Bureau of Industrial Health, and WILLIAM M. PIERCE, Industrial Hygiene Engineer, Massachusetts Division of Occupational Hygiene. J. J. BLOOMFIELD, National Institute of Health, Bethesda, Maryland, became 1st Past-President and H. H. SCHRENK, U. S. Bureau of Mines became 2nd Past-President. The Secretary reports that there is now a total of 382 members of the Association, 19 having been dropped and 20 new members approved during the last year. One new local section, known as the Baltimore-Washington Section, has been formed and two other areas are actively considering the formation of local sections.

Industrial Hygiene Personnel

THE president of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION has appointed a committee to prepare an industrial hygiene personnel roster. All persons interested in available openings in industrial hygiene, and all organizations or agencies interested in obtaining the industrial hygiene personnel roster, should notify the secretary of the A.I.H.A., DR. ALLEN D. BRANDT, Safety and Security Division, Office of the Chief of Ordnance, 330 North Michigan Avenue, Chicago 1, Illinois. Those interested in jobs should submit qualifications, age, location, type of position desired, and other pertinent data to the secretary. Likewise, organizations or agencies seeking personnel should state nature of work, location, and other important information. The roster will not be confined to A.I.H.A. members.

Hazard in Paint Remover

ON MAY 12 two representatives of a large industry in Baltimore requested information of the City Health Department about the potential chemical hazards involved in the removal of blackout paint. They faced the task of removing paint from many large windows and skylights in several industrial buildings. The ordinary use of paint remover is on such a small scale that the risks are minimal. On smooth glass surfaces the paint can be removed by scraping it off with a razor blade. This method has been used effectively even on large plate glass windows. However, much of the glass used in modern buildings contains wire and has an uneven or ridged surface which makes scraping impossible and requires the use of a chemical paint remover. Paint removers may be classified in two groups. In the first are solutions of different alkalies which are applied to the paint for some hours after which removal is not difficult. The chief hazard in this method is the risk of dermatitis following skin contact with alkalies. Another disadvantage of the alkalies is that they are apt to spatter on other paint or on machinery and cause damage. The second group of paint removers contains volatile chemicals which act as solvents. The standard formula for these is a mixture of benzol, alcohol and acetone with a small portion of paraffin wax. In some instances methylene chloride has been used. These materials are brushed on the paint which is to be removed and the wax forms a coating under which the solvents attack the paint. The hazards in this group are multiple as methylene chloride is a very volatile narcotic while benzol destroys not only blood cells but if the exposure is prolonged may even damage the blood forming tissue. In addition these chemicals dissolve fat from the skin and are potential causes of dermatitis; many of them are also inflammable. Whatever compounds are used precautions are needed to protect the health of exposed employees. Protective garments such as tightly woven overalls which can be washed and changed frequently and rubber gloves should be worn. If solvents are used gloves made of neoprene are necessary. In order to prevent the inhalation of dangerous quantities of benzol or other solvents the environmental air should be controlled and tested at frequent intervals by means of a benzol indicator. Where readings are high laboratory examination of air samples should be made. As a secondary measure it is wise to have periodic examinations of urine for sulfate ratios and of the blood for both white and red cell counts. The industrial group which has been studying this blackout paint remover problem in Baltimore has adopted the suggested protective measures for the safety of their workers. The Division of Industrial Hygiene of the City Health Department will make the air tests that are needed.

—*Baltimore Health News*, June, 1945.

Local Plant Medical Director

IN A RECENT issue of *The Rustless Recorder*, a monthly publication of the Department of Employee Information and Public Relations of the Rustless Iron and Steel Corporation of Baltimore, announcement was made of the appointment of DR. FRED J. WAMPLER as Medical Director. DR. WAMPLER came to Baltimore from the Medical College of Virginia at Richmond where he had been professor of industrial and preventive medicine and administrator of the outpatient clinic since 1928. He received his medical degree from Rush Medical College at the University of Chicago in 1913, and spent the following 13 years in the practice of medicine in China. DR. WAMPLER was also graduated from the Johns Hopkins School of Hygiene and Public Health in 1929, and is the editor of the authoritative textbook *The Principles and Practice of Industrial Medicine*. The plant medical building now under reconstruction at Rustless will provide room for the expansion of the medical services which will include an x-ray unit to be used for chest roentgenography and such other medical services as preplacement and periodic physical examinations. The facilities for physiotherapy have been enlarged and a clinical laboratory will be placed in operation. Such a progressive program is another manifestation of the management's concern for the health of its employees.

—*Baltimore Health News*, June, 1945.

—*Continued from page 614.*

on Industrial Health, American Medical Association, and Medical Director J. G. TOWNSEND, Chief of the Industrial Hygiene Division, U. S. Public Health Service, presided jointly. The others attending were directors of health department industrial hygiene units of the states represented, the chairmen of the committees on industrial health of the state medical associations, and the executive secretaries of those associations. The first regional industrial hygiene meeting to be held, this was considered so successful that it is planned to hold similar regional conferences in other parts of the Nation.